



Cellular/Epitope/CD4/MHC/CD4/Manager:387572;L  
AIC/Jet  
03/30/03

PATENT APPLICATION  
Attorney's Docket No.: 2007.1000-000

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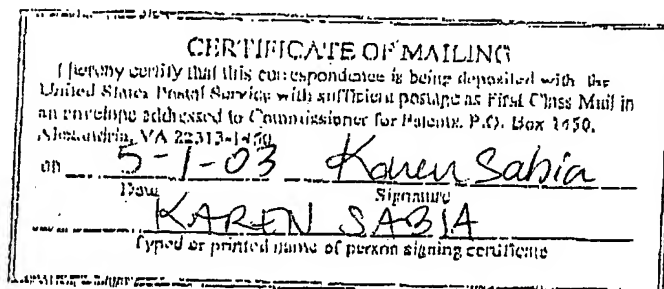
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Andrew McMichael, Adrian V.S. Hill, Sarah C. Gilbert, Jörg Schneider, Magdalena Plebanski, Tomas Hanke, Geoffrey L. Smith and Tom Blanchard

Application No.: 09/454,304 Group: 1648  
Filed: December 9, 1999 Examiner: S. Foley

Confirmation No.: 3485

For: Methods and Reagents for Vaccination Which Generate a CD8 T Cell Immune Response



DECLARATION OF DR. JÖRG SCHNEIDER UNDER 37 C.F.R. §1.132

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

I, Jörg Schneider, of 11 Malford Road, Barton, Oxford, OX3 5BT, United Kingdom, declare and state that:

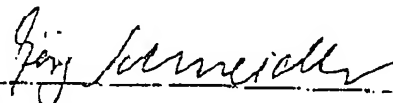
1. I am Vice President/Director of Research at Oxxon Pharmaccines LTD, the owner of the subject application. I received a diploma in Biology from Julius Maximilians University,

**EXHIBIT**

Wurzburg, Germany and a Ph.D. in Biology from the University of Mainz, Germany. Upon completion of my studies, I was a post doctoral research fellow in the Molecular Immunology Group, Institute of Molecular Medicine, Nuffield Department of Medicine, John Radcliffe Hospital, Oxford, UK. I have worked extensively in the area of immunology, in particular in the area of the CD8+ T cell response. My C.V. is attached.

2. I am a co-inventor of the invention claimed in the above-reference patent application. I am familiar with the application, including the claims.
3. This Declaration is being filed in order to address the rejection of Claims 46 and 47 as being anticipated by Hodge *et al.*, *Vaccine*, 15(6/7): 759-768 (1997). Specifically, this Declaration addresses the Examiner's contention that "[a]lthough Hodge *et al.* does not specifically teach generating a CD8+ T cell response, Table 2 on page 765 demonstrates T-cell lymphoproliferative responses with the prime-boost regimen, which inherently included CD8+ T cells" (Office Action, page 6).
4. The Doctrine of Inherency has been explained to me. I understand that according to the Doctrine of Inherency, a basis in fact and/or technical reasoning must be provided to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. I understand that inherency may not be established by probabilities or possibilities and that the mere fact that a certain thing may result from a given set of circumstances is not sufficient.
5. Hodge *et al.* immunized mice with a recombinant vaccinia virus containing the human carcinoembryonic antigen (CEA) gene (rV-CEA) followed by a canarypox (ALVAC) expressing the CEA antigen (ALVAC-CEA) and found that CEA-specific T-cell responses were at least four times greater, and far superior to those achieved with three immunizations of ALVAC-CEA. For the reasons provided below, it is unlikely that the T-cell lymphoproliferative responses Hodge *et al.* observed with the rV-CEA prime and ALVAC-CEA boost included CD8+ T cells.

6. In Table 2, Hodge *et al.* show enhancement of CEA specific lymphoproliferative responses of mouse T-cells after immunization with V-Wyeth and rV-CEA, followed by boosting with ALVAC-CEA. However, in the lymphoproliferative assay Hodge *et al.* used to detect a T cell response, "purified human CEA", or whole CEA protein, was the antigen used. Exogenous soluble protein such as the CEA antigen enter the MHC class II presentation pathway, the pathway in which antigens are presented to CD4+ T cells. Exogenous soluble protein cannot readily enter the MHC class I presentation pathway, the pathway in which antigens are presented to CD8+ T cells. The use of soluble CEA protein in the lymphoproliferative assay of Hodge *et al.* indicates that the responding T cells were CD4+ T cells.
7. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true. Moreover, these statements were made with the knowledge that willful, false statements and the like made by me are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful, false statements may jeopardize the validity of the application or any patent issued thereon.

  
\_\_\_\_\_  
Dr. Jörg Schneider

1<sup>st</sup> May 2003  
\_\_\_\_\_  
Date

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

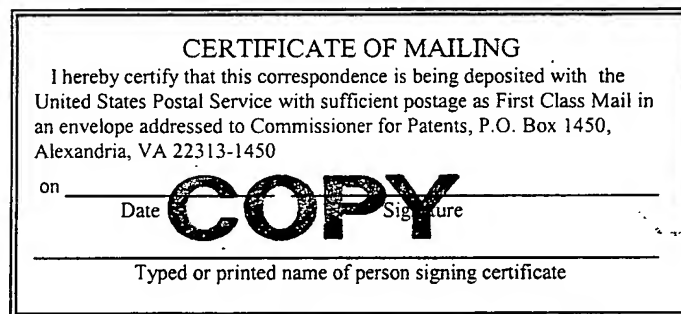
Applicants: Andrew McMichael, Adrian V.S. Hill, Sarah C. Gilbert, Jörg Schneider, Magdalena Plebanski, Tomas Hanke, Geoffrey L. Smith and Tom Blanchard

Application No.: 09/454,204                      Group: 1648

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Wurzburg, Germany and a Ph.D. in Biology from the University of Mainz, Germany. Upon completion of my studies, I was a post doctoral research fellow in the Molecular Immunology Group, Institute of Molecular Medicine, Nuffield Department of Medicine, John Radcliffe Hospital, Oxford, UK. I have worked extensively in the area of immunology, in particular in the area of the CD8+ T cell response. My C.V. is attached.

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Dr. Jörg Schneider

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Date

## CURRICULUM VITAE

NAME	Dr. Jörg Schneider
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TELEPHONE	+44 (0)1865 405 135
MOBILE	+44 (0)797 425 746
FAX	+44 (0)1865-405 136
E-MAIL	j.schneider@oxxonpharmavaccines.com
DATE OF BIRTH	31 of March 1963, Waiblingen, Germany
NATIONALITY	German

June 1990 -- present

VP/Director of Research Oxxon Pharmavaccines Ltd

*As co-inventor of the prime-boost technology I realised that the CD8+ T cell inducing prime-boost technology could be used beyond malaria (see post doc project) in conditions where CD8+ T cells are involved. Involved in initiation and completion of spinout of Oxxon with co-founders, liaised with potential investors to raise seed investment.*

*Responsibilities 1999-2001: Development and execution of clinical and research plan of Company, report progress to the Board and CEO, managing of contract manufacturing, contract and in-house preclinical testing (toxicity, biodistribution and potency) of DNA vaccines and recombinant viral vectors, co-ordinate preparations of submissions to regulatory authorities in the UK (MCA, GTAC and BODAC); co-ordinate preparations for phase I studies in the UK using DNA vaccines and recombinant viral vectors; maintain and expand relationships with academic (scientific and medical) collaborators and founders of the Company; support company's patent filings and maintenance; Communicate scientific basis of company to potential investors, licensors and potential partner companies; close involvement in the set-up of the company as Company's Secretary*

*Responsibilities, 2001-present: Due to the growth of the company priority of responsibilities changed to: Develop and communicate scientific strategy/vision for the company, develop and grow internal research capabilities to stay on the leading edge of Oxxon's science base and support of clinical development, manufacturing of clinical trial material, IP and business development strategy, recruited and manage research group of 9 scientists (4 PhDs.)*

Sept. 1995 -- June 1999

Post doctoral research fellow in the Molecular Immunology Group  
(Prof. Adrian Hill), Institute of Molecular Medicine, Nutfield  
Department of Medicine, John Radcliffe Hospital, Oxford, UK.  
Marie Curie Fellow (Training and Mobility of Researchers in the EC,  
TMR)

*Prof. Hill's group was chosen for post doctoral project to work on the development of CD8+ T cell inducing malaria vaccines. Worked mainly on pre-clinical development and cellular immunology of Plasmodium-specific CD8+ T cell-inducing malaria vaccine. This work lead to the discovery of heterologous prime-boost technology. Supervised research assistant, presentation of work at scientific meetings.*

#### Education

Nov. 1991 - Aug. 1995

Ph. D. thesis in biology, University of Mainz, Germany,  
Title: Recognition of the melanoma antigen MELAN-AMART-1 by  
autologous cytotoxic T lymphocytes.  
Supervisor: P. D. Dr. T. Wölfel  
Grade: summa cum laudae  
From April 1992 - Aug. 1995 Fellow of the: Graduiertenkolleg  
"Molecular and cellular mechanisms of pathogenesis", Johannes  
Gutenberg-Universität Mainz, Germany.

*Key result of the PhD work was the cloning of the melanoma-associated antigen Melan-AMART-1 using melanoma-specific CD8+ T cells. This lead to the identification of a HLA-B44-restricted CD8+ T cell epitope. Following this project I realised that now tumour associated antigens will be identified quickly and that ways to induce/use CD8+ T cells will be the major bottleneck in using CD8+ T cells therapeutically. In addition to acquiring solid skills in cellular immunology and molecular biology I developed project management and presentation skills*

Sept. 1991

Diploma in biology (Note: sehr gut), Julius Maximilians University  
Würzburg, Germany

May 1990 - June 1991

Diploma thesis in biology, Department for Neurology, University of  
Würzburg, Germany  
Title: Analysis of the cellular immune response against primary brain  
tumours.

June 1988 - May 1990

Graduate studies (zoology: cell- and developmental biology, genetics,  
virology, immunology and organic chemistry, University of Würzburg).  
Field project on chimpanzees in a primary tropical rain forest in Tai  
National Park Cote d'Ivoire, West Africa.

Aug. 1987- May 1988

University of Texas at Austin, U.S.A., College of Natural Sciences  
(Fulbright Travel Fellow)



Nov. 1982 - Aug 1987

Undergraduate courses in biology, University of Würzburg  
(April 1983 - July 1984 civil service in the Department of  
Neurology at the University Hospital Würzburg)

Sept. 1976 - May 1982

Abitur (A-Levels)  
Aufbaugymnasium, Künzelsau

#### *Publications (Articles and Patents)*

##### *Articles:*

Stanisl J. McCroney, William H.H. Rees, Vasce S. Moorthy, Daniel Webster, Susie Dunachie, Geoff Butcher, Jenni M. Vuola, Tom J. Blanchard, Philip Gothard, Kate Watkins, Carolyn M. Hannan, Simon Iversen, Karen Brown, Kent E. Kester, James Cummings, Jackie Williams, D. Gray, Heppner, Anwar Pathan, Kello Flanagan, Nirmalan Arulanandham, Mark. T. M. Roberts, Michael Roy, Geoffrey L. Smith, Jörn Schneider, Tim Peto, Robert E. Sinden, Sarah C. Gilbert, Adrian V.S. Hill  
2002 Enhanced T-cell immunogenicity in Humans of Plasmid DNA Vaccines Boosted by Recombinant Modified Vaccinia Virus Ankara. *Nature Medicine* (In press)

Tollfson S, Tiedt T, Schneider J, Harboe M, Wiker H, Hewinson G, Huygen K, Mathiesen I. 2002 Improved cellular and humoral immune responses against Mycobacterium tuberculosis antigens after intramuscular DNA immunisation combined with muscle electroporation. *Vaccine* 20(27-28):3370-8

Ghai H, Schneider J, Hill AV, Whalen RG. 2002 Role of transfection in the priming of cytotoxic T-cells by DNA-mediated immunization. *Vaccine* 20(25-26):3137-47

Gilbert SC, Schneider J, Hannan CM, Hu JT, Plebanski M, Sinden R, Hill AV. 2002 Enhanced CD8 T cell immunogenicity and protective efficacy in a mouse malaria model using a recombinant adenoviral vaccine in heterologous prime-boost immunisation regimes. *Vaccine* 20(7-8):1039-45

Loko H, Bethell DJ, Phuong CX, Dung M, Schneider J, White NJ, Day NP, Farrar J, Hill AV. 2001 Strong HLA class I-restricted T cell responses in dengue hemorrhagic fever: a double-edged sword? *J Infect Dis* 183(11):1365-73

Schneider J, Liepman JA, Gilbert SC, Blanchard TJ, Twigg S, Naitza S, Hannan CM, Aidoo M, Gnanou A, Rossan KJ, Smith GL, Hill AV, Thomas AW. 2001 A prime-boost immunisation regimen using DNA followed by recombinant modified vaccinia virus Ankara induces strong cellular immune

- responses against the *Plasmodium falciparum* TRAP antigen in chimpanzees. *Vaccine* 19(32):4595-602
- Hill AV, Reese W, Gothard P, Moorhuy V, Roberts M, Flanagan K, Plebanski M, Hannan C, Hu JT, Anderson R, Degano P, Schneider J, Prieur E, Sheu E, Gilbert SC. 2000 DNA-based vaccines for malaria: a heterologous prime-boost immunisation strategy *Dev Biol (Basel)* 104:171-8
- Singh MS, Schneider J, Eulliz M, Scholz S, Dornkamm GW, Wolfel T, Reske-Kunz AB. 2000 Consequences of antigen self-presentation by tumor-specific cytotoxic T cells. *Immunobiology* 201(3-4):332-40
- Schneider J, Gilbert SC, Hannan CM, Degano P, Prieur E, Sheu EG, Plebanski M, Hill AV. 1999 Induction of CD8+ T cells using heterologous prime-boost immunisation strategies. *Immunol Rev* 170:79-94
- Degano P, Schneider J, Hannan CM, Gilbert SC, Hill AVS. 1999 Gene gun intradermal DNA immunization followed by boosting with modified vaccinia virus Ankara: enhanced CD8+ T cell immunogenicity and protective efficacy in the influenza and malaria models. *Vaccine* 18(7-8):623-32
- Gilbert SC, Schneider J, Plebanski M, Hannan CM, Blanchard TJ, Smith GL, Hill AVS. 1999 Ty virus-like particles, DNA vaccines and Modified Vaccinia Virus Ankara: comparisons and combinations. *Biol Chem* 380:299-303
- Plebanski M, Gilbert SC, Schneider J, Hannan CM, Layton G, Blanchard T, Becker M, Smith G, Blüthner G, Sinden RE, Hill AVS 1998 Protection from *Plasmodium berghei* infection by priming and boosting T cells to a single class I-restricted epitope with recombinant carriers suitable for human use. *Eur J Immunol* 28:43-55
- Schneider J, Gilbert SC, Blanchard TJ, Hanke T, Robson KJ, Hannan CM, Becker M, Sinden R, Smith GL, Hill AVS 1998 Enhanced immunogenicity for CD8+ T cell induction and complete protective efficacy of malaria DNA vaccination by boosting with modified vaccinia virus Ankara. *Nat Med* 4:107-102
- Hanke T, Blanchard TJ, Schneider J, Hannan CM, Becker M, Gilbert SC, Hill AV, Smith GL, McMichael A. 1998 Enhancement of MHC class I-restricted peptide-specific T cell induction by a DNA/prime/MVA boost vaccination regime. *Vaccine* 16:139-145

- Marke T, Blanchard TJ, Schneider J, Ogg GS, Tan R, Becker M, Gilbert SC, Hill AV, Smith GL, McMichael A. 1993 Immunogenicities of intravenous and intramuscular administrations of modified vaccinia virus Ankara-based multi-CTL epitope vaccine for human immunodeficiency virus type 1 infection. *J Gen Virol* 70:83-90
- Schneider J, Blanchard V, Bonn T, Meyer zum Buschenfelde KH, Wolfel T. 1998 Overlapping peptides of melanocyte differentiation antigen Melan-A/MART-1 recognized by autologous cytolytic T lymphocytes in association with HLA-B\*45.1 and HLA-A\*2.1. *Int J Cancer* 75:451-458
- Romero P, Gervais N, Schneider J, Escobar P, Valmor D, Pannellier C, Steinle A, Wolfel T, Lienard D, Blanchard V, Van Pel A, Jotcreau F, Corbelli JC. 1997 Cytolytic T lymphocyte recognition of the immunodominant HLA-A\*0201-restricted Melan-A/MART-1 antigenic peptide in melanoma. *J Immunol* 159:2366-2374
- Drulman H, Manir M, Jager E, Wolfel T, Schneider J, Karbach J, Seliger B, Huber C, Storkus WS, Lohr MT, Meyer zum Buschenfelde KH, Knuth A. 1996 Recognition of human renal cell carcinoma and melanoma by HLA-A2-restricted cytotoxic T lymphocytes is mediated by shared peptide epitopes and up-regulated by interferon-gamma. *Scand J Immunol* 44:255-262
- Herr W, Schneider J, Lohse AW, Meyer zum Buschenfelde KH, Wolfel T. 1996 Detection and quantification of blood-derived CD8+ T lymphocytes secreting tumor necrosis factor alpha in response to HLA-A2.1-binding melanoma and viral peptide antigens. *J Immunol Methods* 191:131-142
- Wolfel T, Hauer M, Schneider J, Serrano M, Wolfel C, Kiehm-Hieb E, De Plaen E, Henkel T, Meyer zum Buschenfelde K-H, Dech D. 1995 A p16INK4-insensitive CDK4 mutant targeted by cytolytic T lymphocytes in a human melanoma. *Science* 269: 1281-84
- Conti PG, Blanchard V, Van Pel A, Wolfel T, Schneider J, Traversari C, Mattei S, De Plaen E, Lurquin C, Srikora J-P, Renauld J-C, Boon T. 1994. A new gene coding for a differentiation antigen recognized by autologous cytolytic T lymphocytes on HLA-A2 melanomas. *J. Exp. Med.* 180(1): 35-42
- Wolfel T, Schneider J, Meyer zum Buschenfelde K-H, Rammensee H-G, Rötzschke O, Falk K. 1994. Isolation of naturally processed peptides recognized by cytolytic T lymphocytes (CTL) on human melanoma cells in association with HLA-A2.1. *Int. J. Cancer* 57(3): 413-418

Wölfl T, Van Pel A, Brichard V, Schneider J, Seliger B, Meyer zum Büschenfelde K-H, Boon T. 1994. Two Tyrosinase nonapeptides recognized on HLA-A2 melanomas by autologous cytolytic T lymphocytes. *Eur. J. Immunol.* 24(3): 759-764

Jachimczak P, Dögdahn U, Schneider J, Gehl C, Meixensberger J, Apfel R., Dorries R., Schlingensiefen K-H, Brysch W. 1993. The effect of transforming growth factor-beta 2-specific phosphorothioate-anti-sense oligodeoxynucleotides in reversing cellular immunosuppression in malignant glioma. *J. Neurosurg.* 78(6): 914-951

#### Patents

WO 96/055919 Reagents for vaccination which generate a CD8+ T cell immune response (Granted in Europe)

WO 01/21201 Use of replication-deficient adenoviral vector to boost CD8+ T cell immune responses to antigen

WO 02/24224 Vaccination Method